

**1. Describe the practice proposed for recognition and list its objectives, how it promotes high student achievement and how it can be replicated.**

My seventh grade life science classes are raising brook and brown trout in the classroom. This project-based learning experience is designed to integrate observation skills, research techniques, scientific problem-solving and community involvement. In keeping with the need for authenticity, this activity allows students to develop a working relationship with their local community and environment.

Our project begins in late October, after the students have learned data collection techniques and the steps of scientific problem solving. In preparation, the students have researched several species of indigenous trout. Using graphic organizers, they compare and contrast physical features, behavior and habitat requirements for each species. With the help of our local chapter of Trout Unlimited, an international environmental group, we receive several hundred brook and brown trout eggs from a local hatchery. The students have prepared a 55-gallon tank equipped with several filters and a chiller to keep the water temperature at 55°F. Within two weeks, the eggs begin to hatch. Using video microscopy, we have been able to view on a TV screen, as well as record, the hatching of our fry. We are able to videotape the young fishes' internal organs through their thin skin, including blood flow through the capillaries and fat globules in the yolk sac. After about a week the eggs have all hatched and our journaling moves into high gear.

At this stage, the students record statistics for the fish, including size, behavior and mortality rate. Video follow-up and comparisons to early tapings allow the students to document minute physical changes as well. Keeping strict weekly data, they take water samples and monitor several chemical levels to insure the health of the fish. They are responsible for remediation when necessary. Over the next six months, the students maintain the tank and nurture the hatchlings. Continual reinforcing research is conducted. The students give a presentation to the local fishing club explaining their project. The local watershed commission speaks to our classes to validate the importance of clean waters in the ecosystem and survival of our trout. We utilize the Internet to correspond with other schools on the West Coast that are doing similar projects. This helps in commiserating and creative problem solving through teamwork. We have even begun designing a web site about our project.

This on-going project culminates in late April/early May. At this point, our fish are about 3 to 4 inches long. Working closely with Trout Unlimited, we secure permits and release our surviving fingerlings into the local stream. Several students have participated in the release, which proves to be a bittersweet experience for all.

After four years, this program is an ever-changing and multi-faceted. There is a sense of ownership and continued interest that they will carry with them forever.

***Objectives of the Program include the following:***  
Students will:

- Utilize the scientific method
- Develop problem solving skills
- Research various sources
- Develop portfolios
- Utilize the Internet
- Perform scientific tests
- Evaluate research materials
- Develop note-taking skills
- Compare and contrast species
- Maintain journal
- Investigate environmental needs
- Hypothesize to develop experiment for remediation
- Schedule testing
- Collect data
- Create articles for media publication
- Create tables and charts
- Calculate mortality rates and %
- Graph collected data
- Evaluate data
- Develop remediation plan
- Retest and reevaluate for success
- Create artistic representations
- Work with community groups
- Communicate with other “scientists”
- Report orally
- Predict outcomes
- Work cooperatively to make decisions

- 2. List the specific *Core Curriculum Content Standards*, including the *Cross-Content Workplace Readiness Standards*, addressed by the practice and describe how the practice addresses those standard(s). Provide an example to substantiate your response.**

***NJ Science Core Curriculum Standards***

**Educational Goals:**

- To explore basic biological concepts, including embryology, genetics and physiology of an indigenous species (5.1:9, 5.6:2-8,12-17,5.7:3-13)
- To develop research and scientific observation skills (5.2:1-5, 5.2:9-15,5.5:1-4,7-15, 5.12:9,10)
- To utilize technology as integral part of educational forum (5.2:12-15, 5.4:1,2, 4-6,8-11)
- To encourage “writing across the curriculum” (5.3:6)

**Global Objectives of the Project:**

- To encourage a sense of stewardship for the environment (5.12:1-15)
- To involve community in the school (5.3:6)
- To develop appreciation of environmental relationships and interactions (5.12:1-15)
- To present authentic, real-time situations which lead to learning (5.4:10,11)

### ***Cross-Content Workplace Readiness Standards and Indicators***

- To work cooperatively with other on a project (1.1, 4.2, 4.6)
- To work with community to demonstrate skills (1.8)
- To utilize computer to communicate with others, and produce graphic tools (2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8)
- To produce timelines for project goals (4.1, 4.9)
- To apply study skills to successfully reach project goals (3.15, 4.10)
- To conduct research as critical resource (3.5, 3.8)
- To record observations and collect data (3.7, 3.12)
- To hypothesize possible solutions through data interpretation (3.12, 3.14, 3.15)
- To investigate solutions to similar problems (3.1, 3.3, 3.9, 3.10, 3.11, 3.13, 3.14)

3. **Describe the educational needs of students that the practice addresses. Document the assessment measures used to determine the extent to which the objectives of the practice have been met. Provide assessments and data to show how the practice met these needs.**

#### ***Educational needs of the students:***

- To integrate scientific skills into everyday life
- To understand the concepts of natural selection
- To appreciate variation within species and its impact on evolution
- To see the dependent relationships in an ecosystem
- To learn how to solve problems creatively
- To appreciate the importance of data collection and interpretation
- To compare and contrast in order to make evaluations
- To build a link with the community
- To develop respect for the environment

#### **Assessment measures**

Students will produce:

- Chronological journals of scientific observations
- Data collection records
- Charts, tables and graphs interpreting data
- Timelines showing progression of development
- Visual and graphic organizers, particularly Venn diagrams, to compare and contrast species.
- Posters or detailed drawings of some aspect of development
- Vocabulary lists to reinforce classroom discussion
- Tests and quizzes

**4. Describe how you would replicate the practice in another school and/or district.**

Working closely with a local chapter of Trout Unlimited or other fishing/environmental club will help facilitate the implementation. The majority of the equipment is standard aquarium fare but the project does require certain apparatus. The major expense is for a water chiller to maintain the temperature below 60°F. Eggs and food can be secured from local hatcheries. Although this project may be done on a smaller scale, a 55-gallon tank with an underground and/or back filter is adequate for about 200 eggs. An aerator pump and bubbler is necessary, as trout require high oxygen content in the water. Water monitoring tests should be used to maintain proper water quality. With the help of a grant from Trout Unlimited, I was able to purchase the magnifying video-cam. The students' own interest will lead this project in unexpected directions. These student-driven tasks are often the most educational. At the request of one child, we have even held family fly-tying clinics in our classrooms.